MOBILE COMMUNICATION TERMINAL WITH LIGHT EFFECTS EDITOR

The present invention relates to a mobile communication terminal capable of playing music from music data and
5   provided with a plurality of lights. In particular, the present invention relates to the control of the activation of the lights, using the information in said music data.

10 BACKGROUND ART

WO 03/077505 discloses a mobile communication terminal comprising a plurality of lights and means for controlling the activation of the lights. An audio
15 signal, e.g. from a ringing tone, is fed to a signal processor that filters the signal and controls the activation of the lights to let the phone act as a light organ.

20 The Musical Instrument Digital Interface (MIDI) is an internationally accepted standard for music data for communication between digital music devices. MIDI enables polyphonic musical compositions with a wide variety of different sounds. This means that multiple tones can be
25 played at the same time using predefined instrument sounds such as piano, guitar, violin, drums, etc. The information transmitted between MIDI devices is in the form of MIDI messages, which encode different aspects of sound such as pitch and volume as 8-bit bytes of digital
30 information. MIDI devices can be used for creating, recording and playing back music that is stored as a MIDI file (multiple MIDI messages). Using the MIDI standard, sound cards in computers, synthesizers, and sequencers can communicate with each other, either keeping time or
35 actually controlling the music created by other connected equipment. The message types in a MIDI sequence can be

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divided in channel messages and system messages. Channel messages apply to a specific channel, and the channel number is included in the status byte for these messages. System messages are not channel specific, and no channel number is indicated in their status bytes.

Channel messages may be further classified as being either channel voice messages, or mode messages. Channel voice messages carry musical performance data, and these messages comprise most of the traffic in a typical MIDI data stream. Channel mode messages affect the way a receiving instrument will respond to the Channel Voice messages.

Channel Voice Messages are used to send musical performance information. The messages in this category are the NOTE ON, NOTE OFF, Polyphonic Key Pressure, Channel Pressure, Pitch Bend Change, Program Change, and the Control Change messages.

With the advent of mobile communication terminals provided with synthesizers capable of playing polyphonic ringing tones from e.g. SP-MIDI files the acoustic quality of the terminals has increased rapidly. Scalable polyphony MIDI (SP-MIDI) is a recent enhancement to the MIDI format that makes it particularly suitable for mobile terminals. SP-MIDI functionality is implemented using a new MIDI message called the Maximum Instantaneous Polyphony (MIP) message. The MIP message is used to define the musical arrangement of the SP-MIDI content according to the desired polyphony levels.

EP 1 255 418 discloses a mobile communication terminal capable of playing ringing tones from MIDI files. The mobile terminal is also provided with a plurality of lights that can be activated by the processor. The

document proposes to control the activation of the lights
in a MIDI file. Hereto, the lights are implemented as an
instrument, with each light seen as a different note.
This would however require a modification of the MIDI
5   standard, in particular of the SP-MIDI standard, since
none of the instruments (also referred to as timbres or
patches) presently defined in these standards are lights.
The modification of such a standard is a complicated
procedure that involves many parties with different
10 interests, and can - if it succeeds at all - take a very
long time. Further, different terminal models are likely
to have varying light arrangements, an aspect that would
be difficult to deal with when the lights are defined as
an instrument in the standard, since this would require
15 the terminals to be provided with lights in a more
uniform manner.

DISCLOSURE OF THE INVENTION

20 On this background, it is an object of the present
invention to provide a mobile communication terminal
capable of controlling the activation of the lights from
information in a music data file in a versatile manner.

25 This object is achieved by a mobile communication
terminal comprising a processor unit being configured to
control said communication terminal, an electronic memory
having music data stored thereon, said music data
including at least a first and a second message type, the
30 first type messages containing information for notes to
be played, the second type messages containing other
music related information for the mobile communication
terminal, a loudspeaker connected to a sound generator
configured for generating audio waveforms in accordance
35 with the information in the first type messages, a
plurality of lights that can be activated by the

processor, and the processor unit being configured by the
information in second type messages to activate the
lights based on the information contained in the first
type messages.

Using the second type messages for mapping the activation
of the lights to the first type messages allows the
lights to be activated in a versatile way, without need
to define the lights as new instruments in the music data
standard. By specifying music files for a particular type
of terminal, differences in light arrangements between
terminal models can be handled by music files being
provided with second type messages with different mapping
information.
The mapping information may relate to the location, color
and intensity of the lights. Recognizable patterns may be
mapped to the playing of a note.

The mapping is preferably directly towards note-on and
note-off commands contained in the first type messages.
The intensity or intensity profile is preferably mapped
to velocity information in the first type messages.

Preferably, the first type messages assigned to one
specific channel are used for the activating the lights.
The instrument assigned to the notes, e.g. the grand
piano, in the messages of this channel could be an active
part in the played music, or the volume of this channel
could be set to zero, so that the lights can be
controlled without any influence on the music itself.

The mapping is preferably performed by a function whose
arguments comprise the note number. A first parameter may
be added or subtracted from the note number and the
result can be integer and/or modulo divided by a second
parameter in the function. The second parameter may

depend on the terminal model, the number of light positions, and/or the number of colors for the lights.

The function preferably reduces the number of available notes to the number of available light locations and the number of available light colors respectively.

The mapping may comprise a random function.

It is also possible to use a look up table for the mapping.

The terminal may comprise a vibrator, a flashlight and/or a camera flash and the processor could be configured by second type messages to activate the vibrator flashlight and/or camera flash based on the information contained in the first type messages.

The mobile communication terminal may further comprise an editor application enabling a user to create and/or edit the second type messages. The editor application may enable the user to select the channel to be used, to select the patterns to be activated, and/or to modify the function.

The terminal may comprise different ranges of lights, e.g. front and back, and the editor application may enable the user to select the range. The editor application may enable the user to map the intensity to the velocity, to a given fixed parameter, or to a random function.

The music data can be a MIDI sequence or file, preferably in the SP-MIDI format. In this case, the second type messages are preferably System Exclusive Messages,

whereas the first type messages are preferably note events.

It is another object of the invention to provide a versatile method for controlling the activation of lights of a mobile communication terminal from information in a music data.

This object is achieved by a method for controlling the activation of lights of a mobile communication terminal configured to play music from music data including at least a first and a second message type, the first message type containing information for notes to be played, the second message type containing other information for the device that is to reproduce the music, comprising the step of placing in the second type messages data mapping the activation of the lights to the note information contained in the first type messages.

This method does not require the lights to be defined as an instrument, and thus avoids the need to change present standards in music data. Further, the activation of the lights is note controlled and therefore much more precise than the control in a light organ which is based on filtering the audio signal.

The data mapping the position of lights to be activated can be placed in the second type messages. The data mapping the color of lights to be activated can also be placed in the second type messages. The data mapping the intensity of lights to be activated can also be placed in the second type messages.

A function whose arguments include the note number can be placed in the second type messages. The function preferably adds or subtracts a first parameter from the

note number and integer and/or modulo divides the result
by a second parameter. The function preferably reduces
the number of available notes to the number of available
light locations and to the number of available light
5   colors respectively. A random function can be applied
within the overall function.

The music data can be a MIDI sequence or file, preferably
in the SP-MIDI format. If the music data is in the MIDI
10   format, the second type messages can be System Exclusive
Messages, whereas the first type messages are preferably
note events.

One or more second type messages can be placed in the
15   beginning of the music data file or sequence for
initializing the mapping. Further, second type messages
can be placed later on in the music data file or sequence
for changing the mapping, the second type messages
preferably being all located within one track.

20
It is a further object of the invention to provide a
computer terminal configured for creating and/or
modifying music data files containing information for
controlling the activation of lights of a mobile
25   communication terminal.

This object is achieved by a computer terminal comprising
a processor unit controlling the terminal, a user
interface comprising a keyboard and a display, an
30   electronic memory having music data stored thereon, said
music data including at least a first and a second
message type, the first type messages containing
information for notes to be played, the second type
messages containing information for mapping the
35   activation of lights on a mobile communication terminal
to the note information in the first type messages, a

loudspeaker connected via an amplifier to a sound generator capable of generating audio waveforms in accordance with the music data, and an application for creating and/or modifying the second type messages.

Thus, music data files containing second type messages including mapping information for the activation of the lights of a mobile communication terminal can be created and or modified on a computer terminal like a PC, and subsequently downloaded to a mobile communication terminal.

The application can be configured to emulate the activation of the lights of a mobile terminal on the display of the computer terminal. This allows the music data file to be tested for both sound and light effects on the terminal without need to download the file to the terminal after each modification for testing.

The application can also be configured for controlling lights of a mobile communication terminal connected thereto for allowing of testing the activation of the lights directly on the mobile communication terminal.

It is a further object of the invention to provide a music data sequence or file for use on a mobile communication terminal that allows for a more versatile control of activation of the lights of the terminal.

This object is achieved by a music data sequence or file for use on a mobile communication terminal, said music data file containing at least first type messages with note information, and second type messages mapping the activation of lights of a mobile communication terminal to the note information contained in the first type messages.

The first type massages preferably contain note-on and note-off commands, and the second type messages preferably contain information mapping the activation of lights to the note-on commands, and information mapping the deactivation of lights to note-off commands.

The first type messages preferably contain velocity information associated with a note-on command, and the second type messages preferably contain information mapping the intensity of a light to be activated to the velocity information.

The first type messages contain preferably the note number associated with a note-on or note-off command, and the second type messages preferably contain a function whose arguments comprise the note number. The function preferably reduces the range of note numbers to the range of light locations on the mobile communication terminal. The function preferably reduces the range of note numbers to the range of light colors on the mobile communication terminal.

The music data file or sequence is preferably in a MIDI format, preferably the SP-MIDI format and the second type messages are preferably system exclusive messages.

Further objects, features, advantages and properties of the mobile communication terminal, the method for controlling the activation of lights of a mobile communication terminal, the computer terminal and music data file or sequence format according to the invention will become apparent from the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following detailed portion of the present description, the invention will be explained in more detail with reference to the exemplary embodiments shown in the drawings, in which

Fig. 1 is a frontal view of a mobile communication terminal according to the invention

Fig. 2 illustrates the terminal of Fig. 1 with the front cover removed,

Fig. 3 is a rear view of the terminal of Fig. 1,

Fig. 4 is a block diagram illustrating the general architecture of a mobile phone in accordance with the present invention,

Fig. 5 is a block diagram of the music and light playing parts of the terminal,

Figs. 6.1 to 6.5 illustrate screen shots of a mobile communication terminal that relate to the handling of ringing tones,

Figs. 7.1 to 7.7 illustrate screen shots of a mobile communication terminal that relate to the handling of light configuration messages,

Fig. 8 is a screen shot of a computer terminal with a MIDI editor program,

Figs. 10 to 14 are screen shots of a light configuration message editor,

Fig. 15 illustrates a computer terminal for use with the present invention, and

Fig 16. illustrates a mobile communication terminal that is connected to the computer terminal of Fig. 15.

DETAILED DESCRIPTION

In the following detailed description, a mobile communication terminal according to the invention in the form of a hand portable phone, preferably a

cellular/mobile phone, will be described by the preferred
embodiments.

Fig. 1 shows a preferred embodiment of a mobile phone 1
5   according to the invention. The mobile phone 1, comprises
a user interface having a keypad 2, a display 3, an
on/off button (present in the top of the phone) a speaker
5, and a microphone 6 (only the opening present in the
lower part of the phone is visible). The mobile phone 1
10   according to the preferred embodiment is adapted for
communication via a cellular network, such as the GSM
900/1800 MHz network, but could just as well be adapted
for use with a Code Division Multiple Access (CDMA)
network or the G3 network.

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According to a preferred embodiment, the keypad 2 has a
first group of alphanumeric keys 9, two softkeys 10, a
cursor navigation key 11 (scroll up/down), and on-hook
and off-hook keys 12. The present functionality 22 of the
20   softkeys 10 is shown in separate fields 21 (softkey-
labels) in the display 3 just above the softkeys. The
softkeys 10 are multifunction keys and their present
function depends on the state of the mobile phone 1. The
softkeys 10 give access to the menu, the phonebook and
25   call can activate actions related to call handling and
message handling. A releasable battery pack (not shown)
is received in a cavity under the releasable rear cover
of the mobile phone 1.

30   The mobile phone 1 is provided with a plurality of lights
7.1..7.6 arranged under transparent parts in the
peripheral area of the front cover 14. The lights
7.1..7.6 are LEDs that can be activated in three
different colors (red, green and yellow) and in a range
35   of 127 different intensities. Different colors can be
created by simultaneous activation of two differently

colored LEDS, or by LEDs with several internal LEDs (e.g. red, green, blue). Further, the keys 9,10,11 and 12 are individually illuminated by backlights 4 formed by LEDs (or could electro-luminescent foils), as shown in Fig. 2 where the releasable attached front cover has been removed and the inner housing 15 of the mobile phone with the lights thereon is visible. The lights 4 can also be activated in three different colors (red, green and yellow) and in 127 different intensities. Up to 3 colors can be lighted in parallel in RGB-LEDs.

The display 3 is an LCD color display with a backlight 8 that can be activated in a range of 127 different intensities. The backlight of display produces only substantially white light.

A flashlight is placed at the top of the phone (not visible) and can be activated in one color and in one intensity (on/off).

Fig. 3 shows the rear of the phone with the releasable attached rear cover 15. Rear cover 15 is provided with transparent parts for the lights 7.1…7.6 that can be seen from the front, sides and rear of the phone. The rear cover 15 is provided with an opening for a lens 16 of a digital camera and an opening for a camera flash 17. The camera 16 is a digital camera provided with a flash. The camera 16 itself is not of relevance for the present invention and therefore not described in further detail.

Fig. 4 schematically shows the most important components of a preferred embodiment of the mobile phone 1, said components being relevant to the understanding of the invention.

The mobile station includes a processor unit 101, which is responsible for the operation of the whole mobile station. The processor unit 101 comprises a microprocessor by means of which functions are controlled and monitored. The mobile station further includes a memory 160, keypad 2 and a data interface 170 dependent on the particular device and application.

Messages to be sent from the mobile station are composed in the processor unit 101 from which they are directed to a transmitter part TX 143 and thence via a duplexer 141, which may be a filter or switch, to an internal antenna 140 to be transmitted further. Sounds received by a microphone 147 can be directed via a speech encoder 146 to the processor unit 101. Messages received by the antenna 140 are directed via the duplexer 141 to a receiver part 142 from which place the message is taken further depending on its type. Received messages may be directed either via the control unit 101 to a message-processing unit or direct to a speech decoder 144 and then to a loudspeaker 145.

A decoder 115 decodes music data and passes the relevant information on to a lights controller 102 and light configuration database 106, a vibrator controller 120, a vibration configuration database 122 and to a MIDI player 134.

The lights controller 102 activates the lights 4,7.1-7.6, and 8; in Fig.4 three lights have been schematically illustrated, but in reality the light controller controls all the lights described before with reference to Figs. 1 to 3 independently.

The MIDI player 134 comprises a synthesizer 130 and a wavetable 132 containing sound samples, e.g. digitized

samples of musical instruments. The synthesizer fetches
sound samples from the wavetable in accordance with
messages received from the decoder 110 and converts the
digital sound samples to analogue audio signals. The
5   sound of existing instruments is sampled and stored
inside the wavetable. The wavetable is a collection of
these small samples. By repeatedly playing samples from
this table in a loop the original sound is imitated. The
synthesizer 130 sends analogue audio signals to be
10   reproduced via an amplifier (not shown) to the
loudspeaker 145.

Data is input to the display control unit 110 from the
processor unit 101 or graphic objects memory 112. The
15   display controller 110 directs the data further to the
display 111 where it is presented to the user. The
control unit 101 also has a direct connection with the
graphic objects memory 112, which means the control unit
can process the graphic objects in memory e.g. by
20   modifying, deleting or adding them.

Ringing tones, and other music data files are stored in
the memory 160. The music data can be OMI, or downloaded
via GPRS or WAP. The music data for the ringing tones is
25   stored in files in MIDI format. The MIDI format used on
the mobile phone is Scalable Polyphony MIDI (SP-MIDI).
SP-MIDI content is supported in Standard MIDI File (SMF)
format according to the SP-MIDI specification: "Scalable
Polyphony MIDI Specification. Version 1.0, RP-034,
30   February 2002, The MIDI Manufacturers Association, Los
Angeles, CA, USA" and the profile specification W
Scalable Polyphony MIDI Device 5-24 Note Profile for
3GPP. December 2001, R-035, The MIDI Manufacturers
Association, Los Angeles, CA, USA"(at polyphony level 4).

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The music data is organized into MIDI messages, which contain one MIDI command or event. A MIDI file contains a sequence of MIDI messages of different types along with timing information. First type messages, herein referred

5 to as NOTE events, such as NOTE ON, NOTE OFF, AllNotesOff, ResetAllControllers, and AllSoundOff, are coded with 16 channel identifiers. Note messages can represent any note from C-2 (i.e. five octaves below middle c; designated as MIDI note 0) to g8 (i.e. five

10 octaves above the g above middle c; designated as MIDI note 127) and the note messages contain information which of the instruments is to be played. The NOTE ON and NOTE OFF messages are usually composed of one, two, or three bytes of data arranged and transmitted one after another.

15

A NOTE ON command comprises three bytes, the first of which is the status byte. This byte tells the synthesizer to play a note and specifies the channel number. The channel number is usually associated with the type of

20 sound to be played, i.e. which instrument of the synthesizer is to be used. The second byte specifies the note to be played and the third byte specifies the velocity value for the note.

25 The second type messages, System Exclusive messages (SysEX message), are used to send data such a patch parameters, sampler data, or sequencer memory bulk dump. The SysEx messages are not always universal and if they are not universal they are in a format that is

30 appropriate for the type of synthesizer that is to play the music. To avoid conflicts with non-compatible SysEx messages, a specific ID number is granted to manufacturers of MIDI instruments by the MIDI Manufacturers Association (MMA) or the Japanese MIDI

35 Standard Committee (JMSC).

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The SP-MIDI files comprise a Maximum Instantaneous Polyphony (MIP) message. The MIP message is used to define the musical arrangement of the SP-MIDI content according to the desired polyphony levels, whereby the MIDI channels are ordered according to channel priority and the polyphony level is defined as a cumulative playback requirement starting from the highest priority channels. The corresponding polyphony levels are also included in the MIP message.

According to a preferred embodiment of the invention the SP-MIDI file includes a sequence of MIDI messages including at least one System Exclusive Message that contains data mapping the activation of the lights to the notes in the first type messages. These System Exclusive messages containing data mapping the activation of the lights will hereafter be referred to as light configuration messages. The MIDI file may further contain a System Exclusive Message that contains data mapping the activation of the vibration unit 121 to the notes in the first type messages. These type of messages will hereafter be referred to as vibration configuration messages.

The mapping of the lights and or the vibration unit may be changed during a song by placing further light/vibration configuration messages at a later stage in the sequence.

Fig. 5 shows schematically a part of an SP-MIDI sequence 150 according to an embodiment of the invention. The sequence has been retrieved from the memory 160 by the processor unit 101. The processor unit passes the sequence to the decoder. The sequence comprises light configuration messages 152 and note events (NOTE ON or NOTE OFF messages) 153.

The decoder 115 handles the timing and decoding and sends the note events 153 in real time via connection 155 to both the MIDI player 134 and the light controller 107. The decoder 115 sends the light configuration messages 152 via connection 154 to the light configuration database 106. The Light configuration database 106 collects the light configuration messages When the light controller 107 receives a note event, it searches the Light Configuration database for configuration information belonging to this note/channel combination, computes the destination(s), color and intensity information and carries out the corresponding light activation(s) or deactivation(s).

The decoder 115 is also connected to the vibration controller 120 and to the vibration configuration database 122, and the same procedure as described with reference to the light controller 107 takes place in the vibration controller 120.

According to a preferred embodiment of the invention the light configuration messages 152 contain data mapping the location of the lights to be activated to the notes in the note events 153. The light configuration messages according to this embodiment further contain data mapping the color of the lights to be activated to the notes in the note events 153. The intensity or intensity profile of the lights to be activated is mapped to the velocity information in the first type message. The light configuration messages can also include information mapping the simultaneous activation or deactivation of groups of lights to the note information in the note events. These groups of lights are preferably arranged in recognizable patterns such as horizontal or vertical lines, concentric rings etc. The second type messages can

contain information that limits the mapping to the note events of a particular channel. The volume setting of the selected channel can be set to zero so that notes played on this channel cannot be heard. This allows the note

5   information in this channel to be exclusively used for light activation, giving a greater flexibility for composers. It is of course also possible to use the notes that are in a channel with a non-zero volume setting, i.e. a channel in which the notes are heard.

10

The mapping information can take different forms. According to one embodiment a simple look up table is used. In order to use less data, it is though preferred to use a function whose arguments comprise the note

15 number. A first parameter can be added or subtracted from the note number and the result is integer and/or modulo divided by a second parameter in the function. The parameters can be user or factory set. The parameters must be chosen such that it is ensured that the number of

20 available notes (128) corresponds to the number of available light locations and colors respectively.

The number of light locations for the mobile phone described above is six for the peripheral lights 7.1...7.6.

25

An example of an appropriate function for location mapping of the lights 7.1 to 7.6 is:

(Note Number-Param1)/Param2%Product Specific Parameter,

30

whereby Param1 = 36, Param2 = 12 and the product specific parameter is 6.

The "/" symbol in the function stands for integer

35 division and the "%" symbol in the function stands for modulo divided.

The product specific parameter is factory set and cannot
be changed by a composer/user. The parameter 1 and 2 can
be varied by a composer to obtain the desired light
5   effects to support the music.

Other examples of appropriate functions for location
mapping of the lights 7.1 to 7.6 are:

10   (Note Number-Param1)%Param2%Product Specific Parameter

and

Param1 % Product Specific Parameter
15

It is also possible to assign a random location to any of
the note events.

The number of colors for the mobile phone described above
20   is three for the peripheral lights 7.1…7.6.

An example of an appropriate function for color mapping
of the lights 7.1 to 7.6 is:

25   (Note Number-Param1) / Param2 % Number Of Product Colors

Parameter 1 and 2 can be selected by a user/composer,
however the selection must be such that the function
reduces the number of available notes to the number of
30   available light colors.

Other useful functions for the color mapping are:

(Note Number-Param1) % Param2 % Number Of Product Colors,
35

Param1 % Number Of Product Colors,

Rand Common, and

Rand Single.

5

Within destination patterns which contain more than 1
destination (e.g. All Lights) it is be possible to choose
1 color for all destinations (Rand Common) or each
individual destination has a randomly chosen color (Rand

10   Single).

Functions that can be used for intensity mapping are:

Velocity,

15   Param1,
     100% Intensity,
     Rand Common, and
     Rand Single.

20   According to a preferred embodiment the flashlight and
     the camera flash are also controlled by lights controller
     102. The camera flash can thus be used to obtain a
     stroboscope effect.

25   Figs. 6.1 to 6.4 show screenshots of the menu on the
     display 3. Fig. 6.1 shows the display after entering the
     menu structure from the idle state shown in Fig. 1 by
     pressing the left softkey 10. The display shows some of
     the menu items of an endless loop type scrollable list of

30   menu items. One of the menu items, "Gallery", can be
     selected to arrive at the display of Fig. 6.2.

     The display now shows some of the "Gallery" submenu items
     in an endless loop type scrollable list. Via the submenu

35   item "View folders" the display of Fig. 6.3 can be
     reached. Here, the user can select between different

folders. By selecting the "Tones" folder and pressing the
left softkey 10 the names of the music data files stored
in the "Tones" folder are listed in a scrollable list as
shown in Fig. 6.4. A particular music data file can be
selected using the navigation key 11 and the left softkey
10 "Options" and the display changes to the screenshot of
Fig. 6.5. listing the options for handling the selected
music data (SP-MIDI) file. The options include opening
the file (i.e. playing the file), deleting, moving or
renaming the file and editing the light effects. By
selecting the "Light effects" menu item an application
for creating, editing and or deleting light activations
associated with the playing of notes in the selected MIDI
file is started.

The opening screen of the light effect editor is shown in
Fig. 7.1. The light effect editor displays a scrollable
list of selectable menu items comprising: "Source",
"Destination", "Mode", "Designation mapping", ""Color
mapping", "Intensity mapping" and "Save".

When the user selects the menu item "Source", the display
changes to the state of Fig. 7.2 and the available
channels are listed as selectable menu items. The user
can now select the desired channel to use as the source
of the NOTE ON and NOTE OFF events that will be used to
activate the lights.

When the user selects "Destination" in the state of Fig.
7.1, the display changes to the state of Fig. 7.3 and the
available light groups are listed as selectable menu
items. The user can now select the light group to be
used, e.g. "Front", "Camera flash", "Flashlight" or
"Backlight".

When the user selects "Mode" in the state of Fig. 7.1,
the display changes to the state of Fig. 7.4 and the
available modes are listed as selectable menu items. The
modes relate to the selection of activation of single
5   lights or activation in groups of lights in recognizable
patterns. The user can now select the desired mode of
activation, e.g. "Location" for the activation of single
lights in particular positions, "Horizontal" for the
activation of groups of lights arranged along a
10 horizontal line, "Vertical" for the activation of groups
of lights arranged along a vertical line, and "Concentric
rings" for the activation of groups of lights arranged in
concentric rings.

15 When the user selects "Destination mapping" in the state
of Fig. 7.1, the display changes to the state of Fig. 7.5
and the available location/mapping functions are listed
as selectable menu items. The list includes different
functions, some use the note number as an argument others
20 simply activate the lights at all locations or activate a
light at a random position. By selecting functions
including user changeable parameters, a new screen
appears (not shown) allowing the user to change the
available parameters (P1,P2). Since the function has to
25 reduce the note range in the song to the number of
available light positions a routine prevents the user
from selecting values for the parameter that would not
fulfill this criterion.

30 When the user selects "Color mapping" in the state of
Fig. 7.1, the display changes to the state of Fig. 7.6
and the available color mapping functions are listed as
selectable menu items. The list includes different
functions, some use the note number as an argument others
35 simply activate the lights in all colors activate a light
in a random color. By selecting functions including user

changeable parameters, a new screen appears (not shown)
allowing the user to change the available parameters
(P1,P2). Since the function has to reduce the note range
in the song to the number of available colors a routine
5   prevents the user from selecting values for the
parameters P1,P2 that would not fulfill this criterion.

When the user selects "Intensity mapping" in the state of
Fig. 7.1, the display changes to the state of Fig. 7.7
10 and the available intensity mapping functions are listed
as selectable menu items. The list includes different
functions, one uses the velocity associated with the note
as an argument others simply activate the light in
accordance with a preselected intensity form a range of
15 128 evenly distributed incremental values. Also random
functions can be selected.

The state of Fig 7.1 can be reached by pressing the right
softkey "Back" in the state of the screens 7.2 to 7.7
20

When the user has finished to create/edit the light
configuration the "Save" menu option in the state of Fig.
7.1 can be used to save the new mapping and the Light
configuration application is closed by pressing the right
25 softkey 10 "Exit". The screen changes to the state of
Fig. 6.5 and the selected song can now be played with the
new light configuration by selecting the menu item
"Open".

30 The mobile phone 1 may in a further embodiment also be
provided with an editor application that enables the user
to create and edit and/or delete all types of MIDI
messages and the timing information (not shown).

35 Fig. 8 shows a screen shot of a PC or similar computer
terminal with a MIDI editor running thereon. The MIDI

editor allows users to compose, record and playback MIDI
files. The MIDI playback function is a software program
that turns the computer into a sequencer. With a sound
card installed inside of the computer, the sequencer can
5   playback   musical   performances   without   even   needing
external MIDI sound modules (since most sound cards now
have   an   internal,   multitimbral   General   MIDI   module,
usually   a   wavetable   synth,   that   can   recognize   and
properly "play" the MIDI messages that the sequencer
10 outputs to the sound card's driver).

The MIDI editor displays a window 202 with a number of
fields with items for use in editing and creating MIDI
files. Field 208 shows an overview of the tracks and the
15 name,   instrument,   device,   channel   and   volume   associated
therewith. Field 210 shows the notes played for each
track.   Field   212   comprises   a   set   of   buttons   for
activating a play, record, pause stop fast forward and
fast rewind functions. All these aspects are conventional
20 and well known in that art and therefore not described in
further detail.

A plug-in program for a conventional MIDI editor displays
a second window 220 that emulates light activations on a
25 mobile.   This   plug-in   comprises   a   software   simulated
decoder,   light   controller   and   light   configuration
database described above. When a MIDI file containing
light   configuration   messages   is   played   by   the   MIDI
editor, the plug-in program activates the lights on the
30 emulated mobile phone in window 220. Thus, the MIDI file
with the light effect can be tested without needing to
first download the MIDI file to the mobile phone 1. The
mobile phone emulation program does not need to be a
plug-in to a conventional MIDI editor program, it could
35 also be an integrated part of a MIDI editor or the like,
also referred to as virtual music studios.

Window 202 also comprises a button 214 for opening a
light configuration messages editor application.

5   Fig. 9 shows a window 230 displayed by the light
configuration messages editor application on the screen
of the PC. The window comprises a "Source" field 232, a
"Destination" field 234, a "Mapping functions" field 236
and a "Result" field 240. The "Source" field 232 includes
10 a channel selection box allowing the user to enter the
channel number numerically and a note type selection pull
down menu allowing the user to select between all notes
numbers or single note numbers. In case the type 'Single
note number' has been selected, the exact note number has
15 to be numerically entered in the param field.

The "Destination" field 234 comprises a destination pull
down menu 233 allowing the user to select the group of
lights that are to be activated, e.g. cover lights
20 7.1….7.6, keyboard lights 4, camera flash 17 or backlight
8.

The "Destination" field also comprises a pull down menu
235 (Fig. 10) allowing the user to select the mapping
25 mode form e.g. the following options: light location,
Automated pattern 1: Horizontal line, Automated pattern
2: Vertical line, Automated pattern 3: Ring (concentric).
When "Location" is selected the mapping is towards single
positions. When patterns are selected a whole group of
30 lights in the shape of the selected pattern are activated
simultaneously.

The "Mapping functions" field 236 includes a "Destination
Mapping" button that activates a pop up window 241 (Fig.
35 11). Pop-up window 241 includes three boxes for
numerically entering the destination range, parameter 1

and parameter 2 of the mapping function. The mapping function is selected in a pull down menu 237 (Fig. 12).

The mapping functions field 236 includes a "Color Mapping" button that activates a pop up window 243 (Fig.

5 13). Pop-up window 243 includes three boxes for numerically entering the color range, parameter 1 and parameter 2 of the mapping function. The mapping function is selected in a pull down menu (not shown) with button 245).

10

The mapping functions field 236 includes also a "Intensity Mapping" button that activates a pop up window (not shown) allowing the selection of the functions and parameters for the intensity mapping described above.

15

The light configuration messages editor application also displays a window 250 "Visualization on the Mobile Phone" on the screen of the computer terminal (Fig. 14). The visualization window 250 includes six fields (as many as

20 there are light positions), and each field contains a scrollable list of items, one item for each MIDI note number (with the musical notation displayed there besides). Each item is displayed in the color to which the note concerned is mapped. In Fig. 14 the three colors

25 red, green and yellow are represented by three different grey scale levels. The visualization window thus shows the light position and color to which a note is mapped and assists the composer in finding the desired settings for the light configuration message.

30

The "Result" field displays the content of light configuration message and includes a "Save" button for saving the light configuration message to the respective MIDI file and an "Exit" button to leave the light

35 configuration editor program.

Fig. 15 shows a PC in the form of a laptop with the MIDI editor window 202 and the mobile phone emulation window 220 displayed on the screen.

5 Fig. 16 shows a PC in the form of a laptop 209 with the MIDI editor window 202 displayed on the screen. A mobile phone 1 is connected to the PC via the respective serial busses and a serial data cable 211. The MIDI editor program or the plug in program and the mobile phone 1 are 10 configured such that the lights of the mobile phone 1 are activated when a MIDI file containing light configuration is played on the MIDI editor on the laptop 209. The complete MIDI sequence is sent via the serial cable to the processor unit 101 that passes the MIDI sequence to 15 the decoder 115, then the procedure of playing the song and activating the lights and the vibration unit is as described above for the playing of MIDI files stored in the memory 160.

20 Although the present invention has been described in detail for purpose of illustration, it is understood that such detail is solely for that purpose, and variations can be made therein by those skilled in the art without departing from the scope of the invention.
25
The present invention has been described with reference to the MIDI format, however other data formats may be used provided that they convey the same types of data information for the control and operation of sound 30 generators and receivers. Examples of such format are OpenSound Control (OSC), ZIPI, GS (Roland MIDI Format) and XMF (eXtensible Music Format).

Thus, while the preferred embodiments of the devices and 35 methods have been described with reference to the environment in which they were developed, they are merely

illustrative of the principles of the inventions. Other embodiments and configurations may be devised without departing from the scope of the appended claims.

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